

Current La Niña Conditions and the Upcoming 2010-2011 Winter Season

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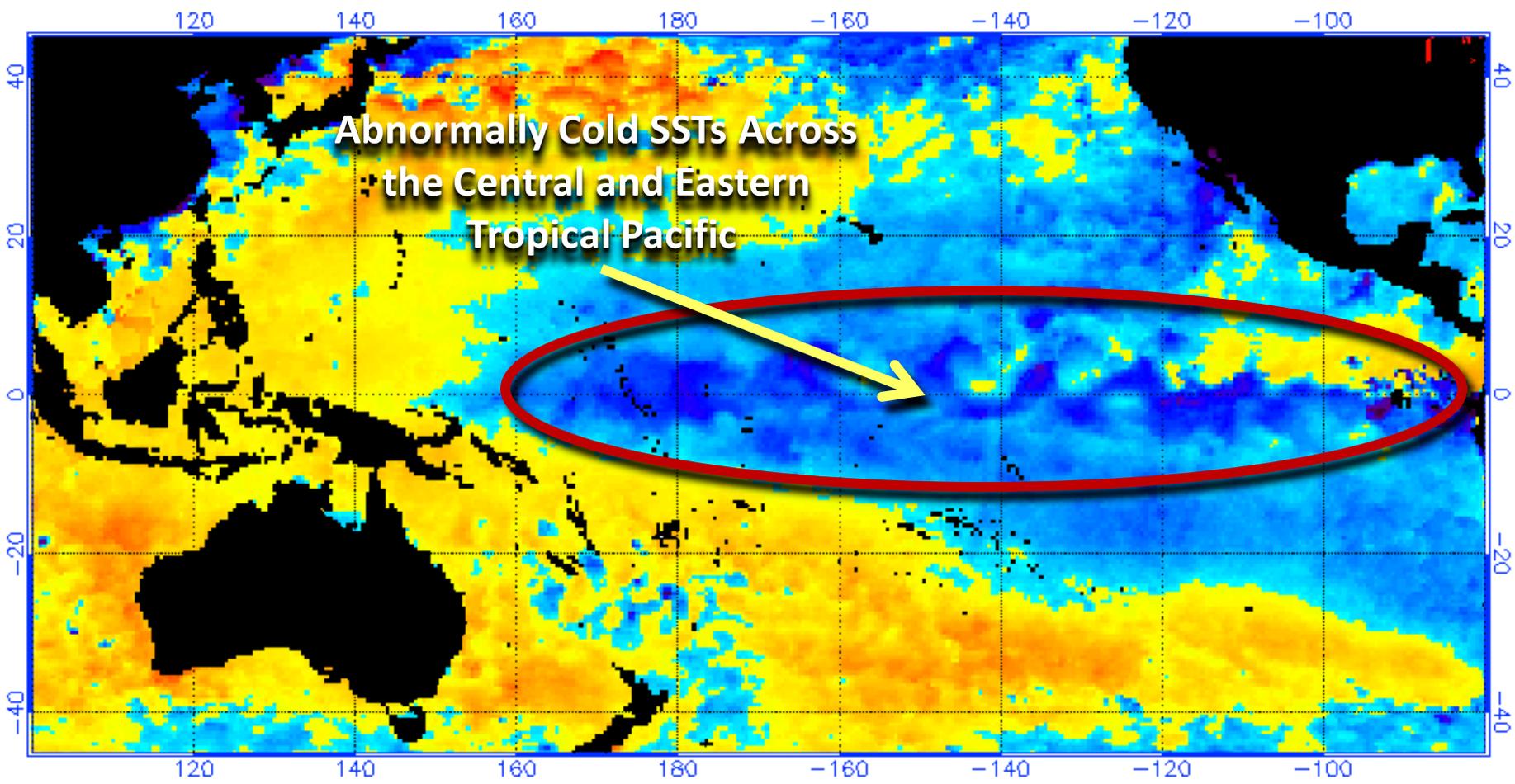
A satellite image of Earth showing the Americas and the Pacific Ocean. The text "Update on La Niña" is overlaid in red with a black outline. The image shows the western coast of North America, the Gulf of Mexico, and the eastern coast of South America. The Pacific Ocean is visible to the west and south of the Americas. There are some white clouds visible in the ocean.

Update on La Niña

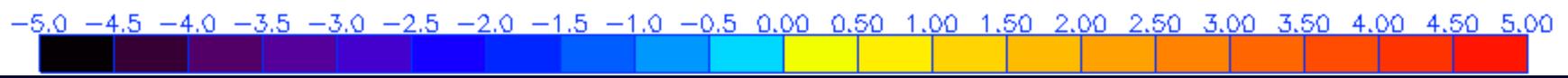
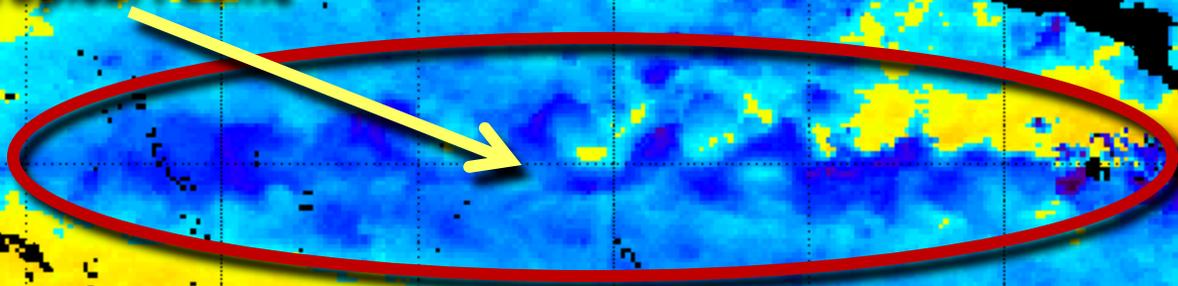
Overview

- **La Niña conditions persist across the central and eastern tropical Pacific Ocean.**
- **Sea surface temperatures (SSTs) in the tropical Pacific from around the International date line to the west coast of South America range from -0.5C to -4.0C below average during the past 4 weeks.**
- **Recent Equatorial Pacific SST trends and model forecasts indicate that a La Niña of moderate to strong intensity will persist for another couple of months, with weak conditions lasting at least through the Northern Hemisphere spring of 2011.**

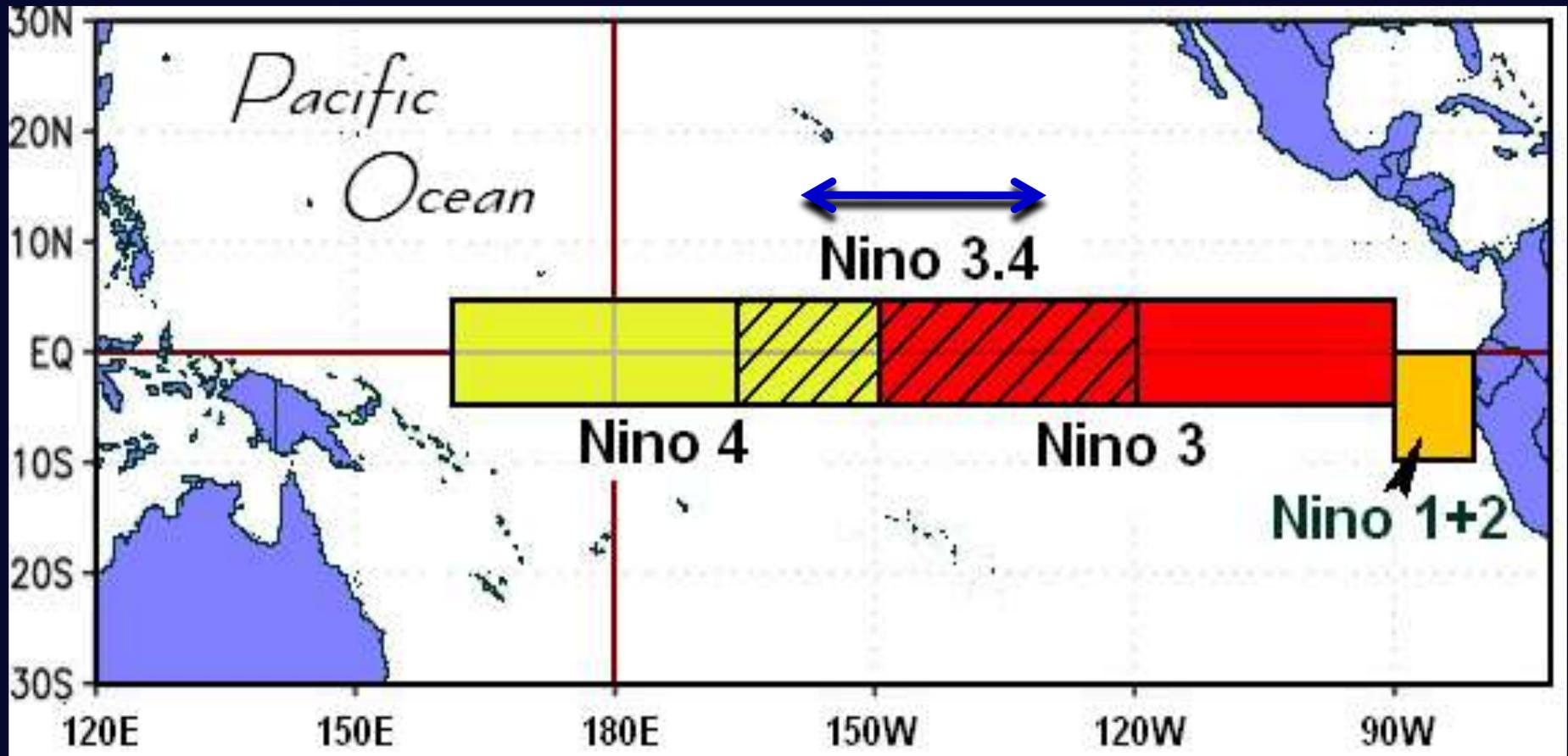
NOAA / NESDIS Satellite Derived SST Anomaly (deg C) Map, 11-18-2010



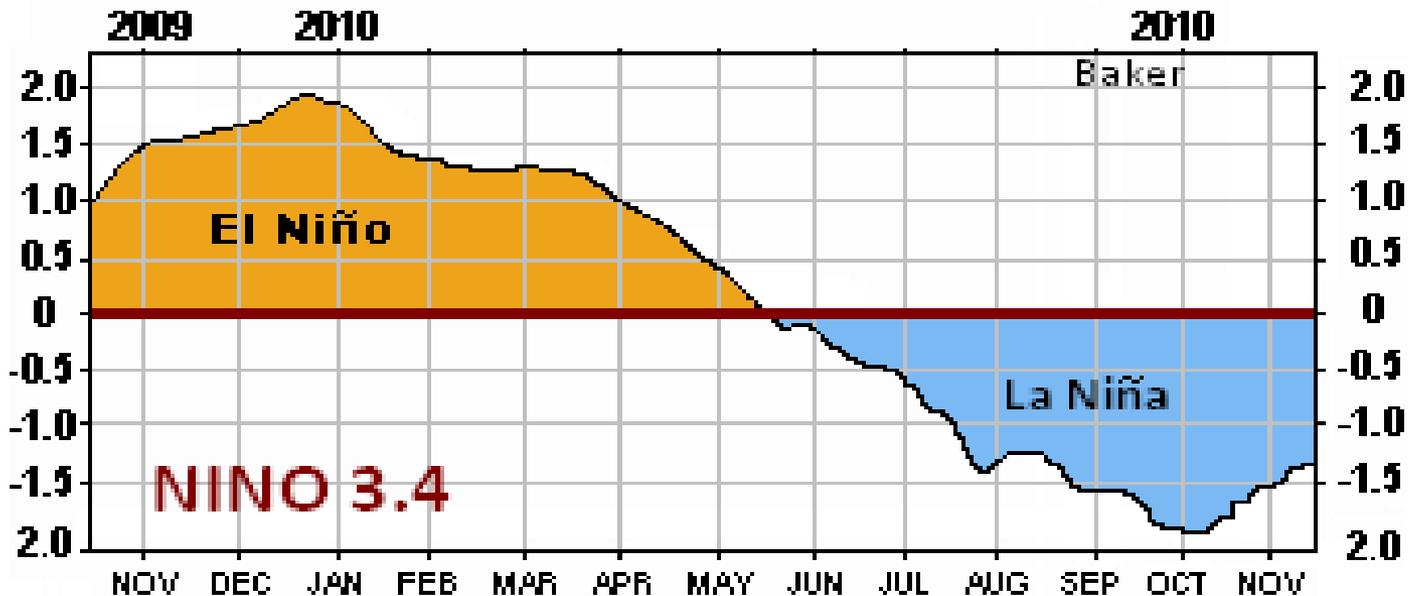
**Abnormally Cold SSTs Across
the Central and Eastern
Tropical Pacific**



Niño Regions in the Tropical Pacific Ocean



Niño 3.4 – The principal region in the eastern tropical Pacific used by the Climate Prediction Center (CPC) for monitoring, assessing and predicting ENSO.



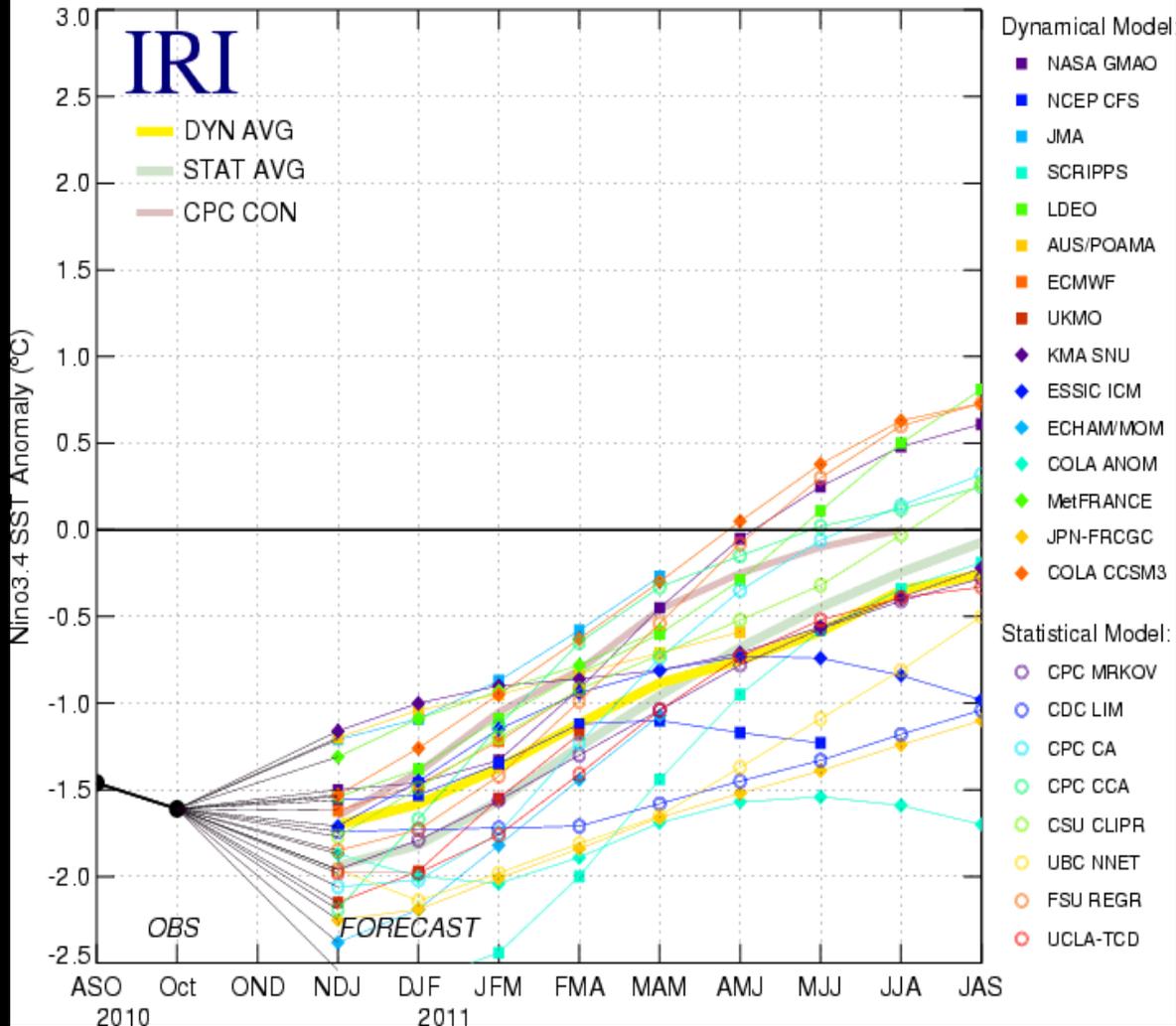
**SST Anomaly (degrees C) for NINO 3.4
as of Nov 16, 2010**

Source: NOAA/Climate Prediction Center

Abnormally cool sea surface temperatures (SSTs) continued to be observed in the NINO 3.4 region of the Eastern Tropical Pacific. The mean SST value of -1.3°C as of November 16th is indicative of a strong La Niña. However, this value has warmed nearly 0.3°C in the past few weeks.

Pacific Niño 3.4 ENSO Outlook

Model Predictions of ENSO from Nov 2010



- A majority of the 23 dynamical and statistical ENSO models indicate either no change or a slight weakening in the current strong La Niña episode (-1.5 C or less) during the 3-month winter season of December-January-February 2010-2011. These same climate models also continue to indicate a La Niña of at least moderate strength (-1.0 C to -1.5°C) through the Northern Hemisphere spring of 2011.

NINO 3.4 Sea Surface Temperature Anomalies Forecasts

Forecast SST
Anomalies (deg C) in
the Nino 3.4 Region

Seasons (2010-2011)

Model	NDJ	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS
Dynamical models									
NASA GMAO model	-1.5	-1.5	-1.3	-0.9	-0.5	-0.1	0.3	0.5	0.6
NCEP Coupled Fcst Sys model	-1.6	-1.5	-1.4	-1.1	-1.1	-1.2	-1.2		
Japan Met. Agency model	-1.2	-1.1	-0.9	-0.6	-0.3				
Scripps Inst. HCM	-2.5	-2.6	-2.4	-2	-1.4	-1	-0.6	-0.3	-0.2
Lamont-Doherty model	-1.5	-1.4	-1.1	-0.8	-0.6	-0.3	0.1	0.5	0.8
POAMA (Austr) model	-1.2	-1	-1	-0.8	-0.7	-0.6			
ECMWF model	-1.6	-1.5	-1.2	-0.9					
UKMO model	-2.2	-2	-1.6	-1.2					
KMA (Korea) SNU model	-1.2	-1	-0.9	-0.9	-0.8	-0.7	-0.6	-0.4	-0.2
ESSIC Intermed. Coupled model	-1.7	-1.5	-1.2	-0.9	-0.8	-0.7	-0.7	-0.8	-1
ECHAMMOM	-2.4	-2.2	-1.8	-1.4	-1.1				
COLA ANOM	-1.9	-2	-2	-1.9	-1.7	-1.6	-1.5	-1.6	-1.7
MÉTÉO FRANCE model	-1.3	-1.1	-0.9	-0.8	-0.6				
Japan Frontier Coupled model	-2.3	-2.2	-2	-1.8	-1.7	-1.5	-1.4	-1.2	-1.1
COLA CCSM3 model	-1.5	-1.3	-1	-0.6	-0.3	0.1	0.4	0.6	0.7
Average, dynamical models	-1.7	-1.6	-1.4	-1.1	-0.9	-0.8	-0.6	-0.3	-0.3

Seasons (2010-2011)

Model	NDJ	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS
Statistical models									
NCEP/CPC Markov model	-2	-1.8	-1.6	-1.3	-1	-0.8	-0.6	-0.4	-0.3
NOAA/CDC Linear Inverse	-1.7	-1.7	-1.7	-1.7	-1.6	-1.5	-1.3	-1.2	-1
NCEP/CPC Constructed Analog	-2.1	-2	-1.8	-1.2	-0.7	-0.4	-0.1	0.1	0.3
NCEP/CPC Can Cor Anal	-2.2	-1.7	-1.1	-0.7	-0.3	-0.2	0	0.1	0.3
Landsea/Knauff CLIPER	-1.8	-1.5	-1.2	-0.9	-0.7	-0.5	-0.3	-0	0.3
Univ. BC Neural Network	-2	-2.1	-2	-1.8	-1.7	-1.4	-1.1	-0.8	-0.5
FSU Regression	-1.9	-1.7	-1.4	-1	-0.5	-0.1	0.3	0.6	0.7
TDC - UCLA	-2	-2	-1.8	-1.4	-1	-0.7	-0.5	-0.4	-0.3
Average, statistical models	-1.9	-1.8	-1.6	-1.3	-1	-0.7	-0.4	-0.2	-0.1
Average, all models	-1.8	-1.7	-1.4	-1.2	-0.9	-0.7	-0.5	-0.3	-0.2

Source: IRI

Oceanic Niño Index (ONI)

- The **ONI** is based on SST departures from average in the Niño 3.4 region, and is a principal measure for monitoring, assessing, and predicting ENSO.
- Defined as the three-month running-mean SST departures in the Niño 3.4 region.
- Used to place current events into a historical perspective
- **NOAA's operational definitions of El Niño and La Niña are keyed to the ONI index.**

NOAA Operational Definitions for El Niño and La Niña

El Niño: characterized by a **positive** ONI greater than or equal to +0.5 C.

La Niña: characterized by a **negative** ONI less than or equal to -0.5 C.

By historical standards, to be classified as a full-fledged El Niño or La Niña episode, these thresholds must be exceeded for a period of at least 5 consecutive overlapping 3-month seasons.

CPC considers El Niño or La Niña conditions to occur when the monthly Niño3.4 OISST departures meet or exceed +/- 0.5°C along with consistent atmospheric features. These anomalies must also be forecasted to persist for 3 consecutive months.

Oceanic Niño Index - ONI

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2000	-1.6	-1.4	-1	-0.8	-0.6	-0.5	-0.4	-0.4	-0.4	-0.5	-0.6	-0.7
2001	-0.6	-0.5	-0.4	-0.2	-0.1	0.1	0.2	0.2	0.1	0	-0.1	-0.1
2002	-0.1	0.1	0.2	0.4	0.7	0.8	0.9	1	1.1	1.3	1.5	1.4
2003	1.2	0.9	0.5	0.1	-0.1	0.1	0.4	0.5	0.6	0.5	0.6	0.4
2004	0.4	0.3	0.2	0.2	0.3	0.5	0.7	0.8	0.9	0.8	0.8	0.8
2005	0.7	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.2	-0.1	-0.4	-0.7
2006	-0.7	-0.6	-0.4	-0.1	0.1	0.2	0.3	0.5	0.6	0.9	1.1	1.1
2007	0.8	0.4	0.1	-0.1	-0.1	-0.1	-0.1	-0.4	-0.7	-1	-1.1	-1.3
2008	-1.4	-1.4	-1.1	-0.8	-0.6	-0.4	-0.1	0	0	0	-0.3	-0.6
2009	-0.8	-0.7	-0.5	-0.1	0.2	0.6	0.7	0.8	0.9	1.2	1.5	1.8
2010	1.7	1.5	1.2	0.8	0.3	-0.2	-0.6	-1.0	-1.3			

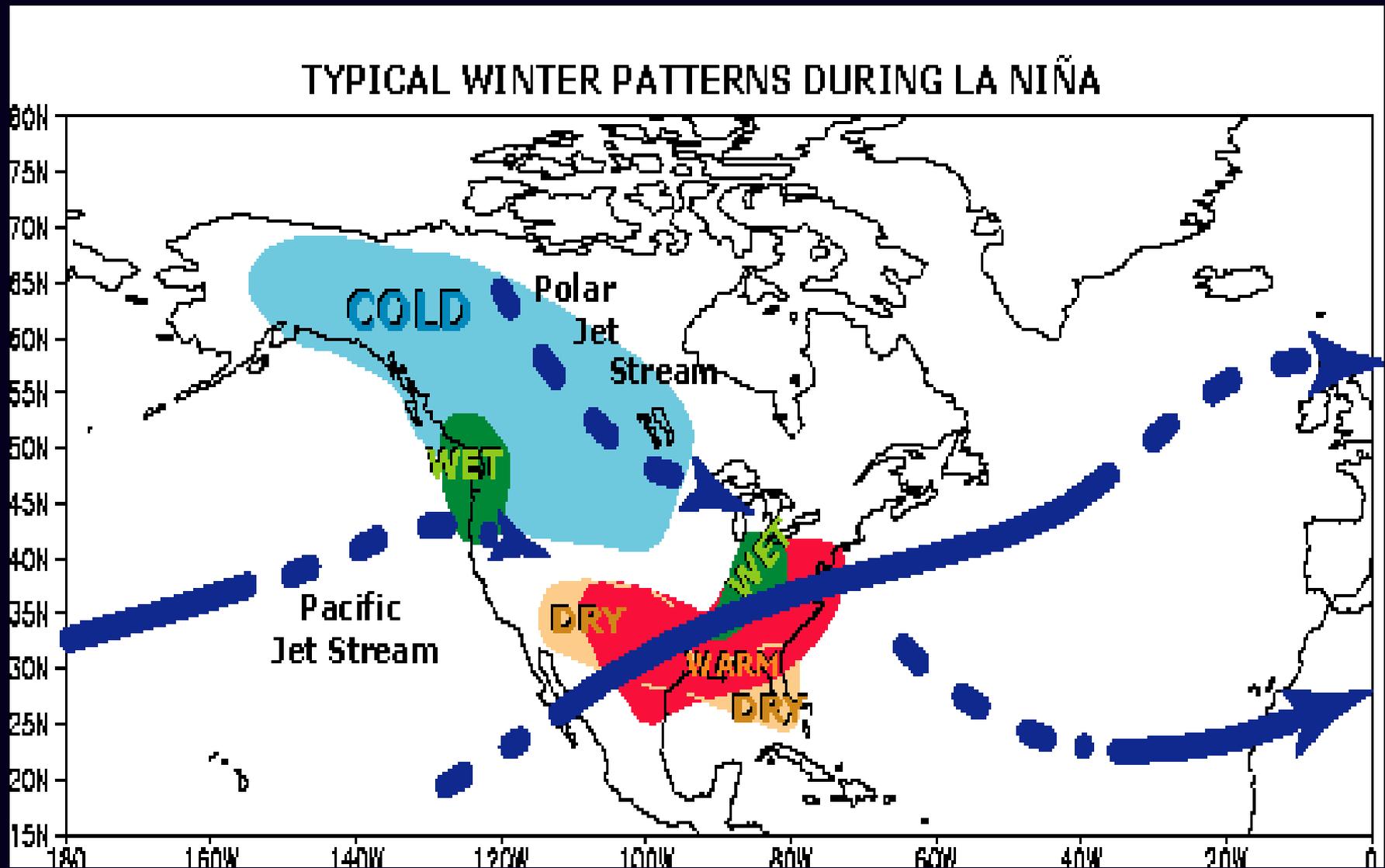
Current La Niña Episode

Warm Episodes - El Niños (in RED): ONI 0.5 and above

Cold Episodes - La Niñas (In Blue): ONI of -0.5 and below

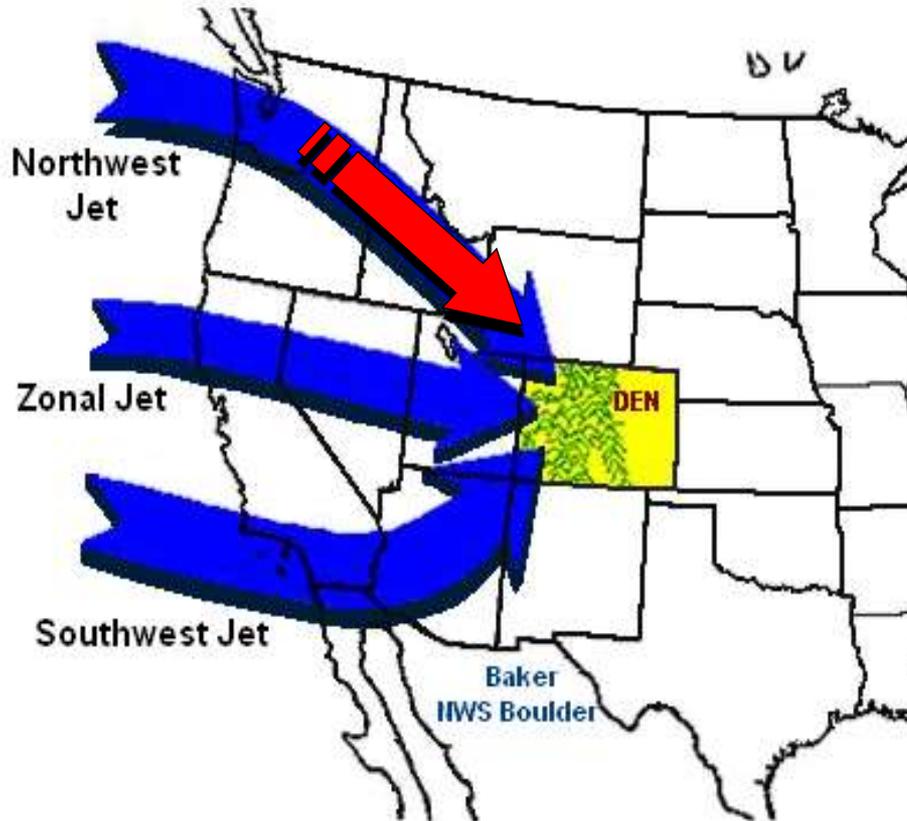
Neutral Episodes -non-ENSO (In White): ONI above -0.5 and below 0.5

Typical North American Temperature, Precipitation and Jet Stream Patterns during La Niña Winters



Source: NOAA/Climate Prediction Center

The Jet Stream and Its Influence on Colorado Weather

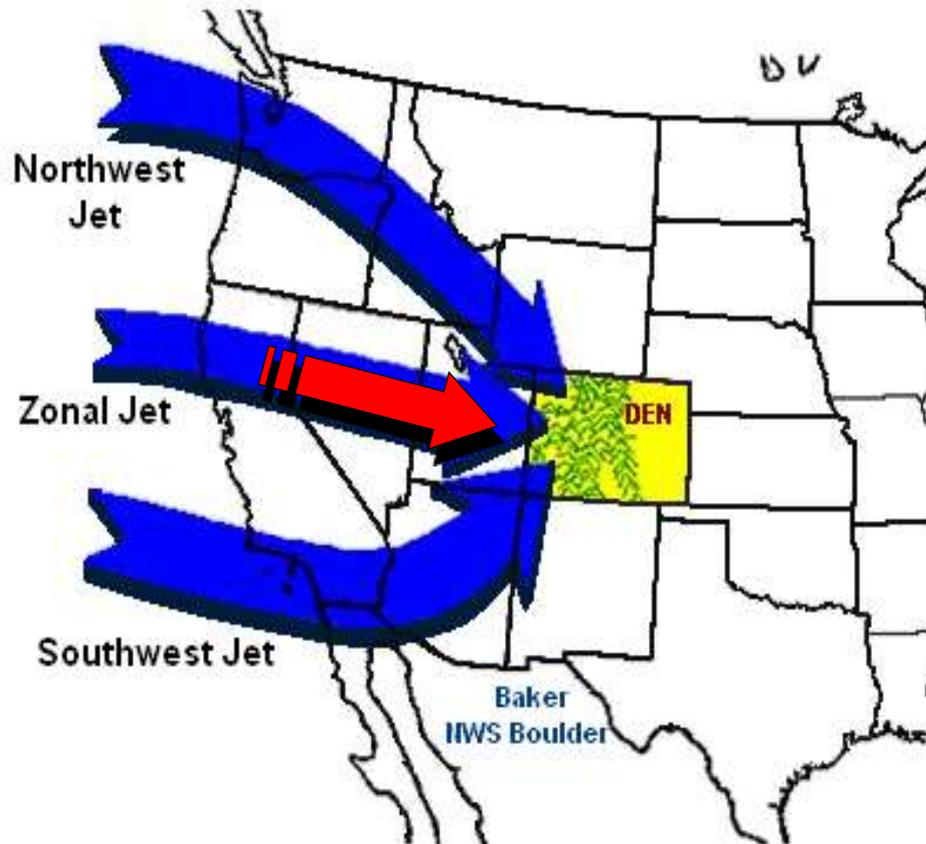


Three different jet stream positions typically observed over the western continental U.S. during the autumn, winter and spring.

A **northwest jet stream pattern** typically persists for weeks at a time over the northwest continental U.S. during the winter and early spring of La Niña episodes, particularly those of moderate to strong intensity.

Potent storms packing plenty of wind and precipitation are carried onshore in the Pacific Northwest by a strong Pacific jet stream are carried inland across the northern Great Basin and eventually down across the mountains and high valleys of western Wyoming and northwest Colorado.

The Jet Stream and Its Influence on Colorado Weather



Three different jet stream positions typically observed over the western continental U.S. during the autumn, winter and spring.

A **westerly or zonal jet stream pattern** will persist for days if not weeks at a times during the winter and spring of El Niño, La Niña and non-ENSO periods. This southward displacement in the Pacific jet stream and storm track typically has a greater impact on southern Oregon, the northern half of California and the central Great Basin.

After slamming the West Coast with wind driven rain and snow, these potent Pacific storm systems race across the Great Basin, eventually reaching the mountains and high valleys of Utah and western Colorado a day or two later. This west-to-east oriented jet stream is more often observed during the winter and early spring of moderate to strong El Ninos, but it is also not uncommon to see this jet pattern during stronger La Niña events.

The Jet Stream and Its Influence on Colorado Weather



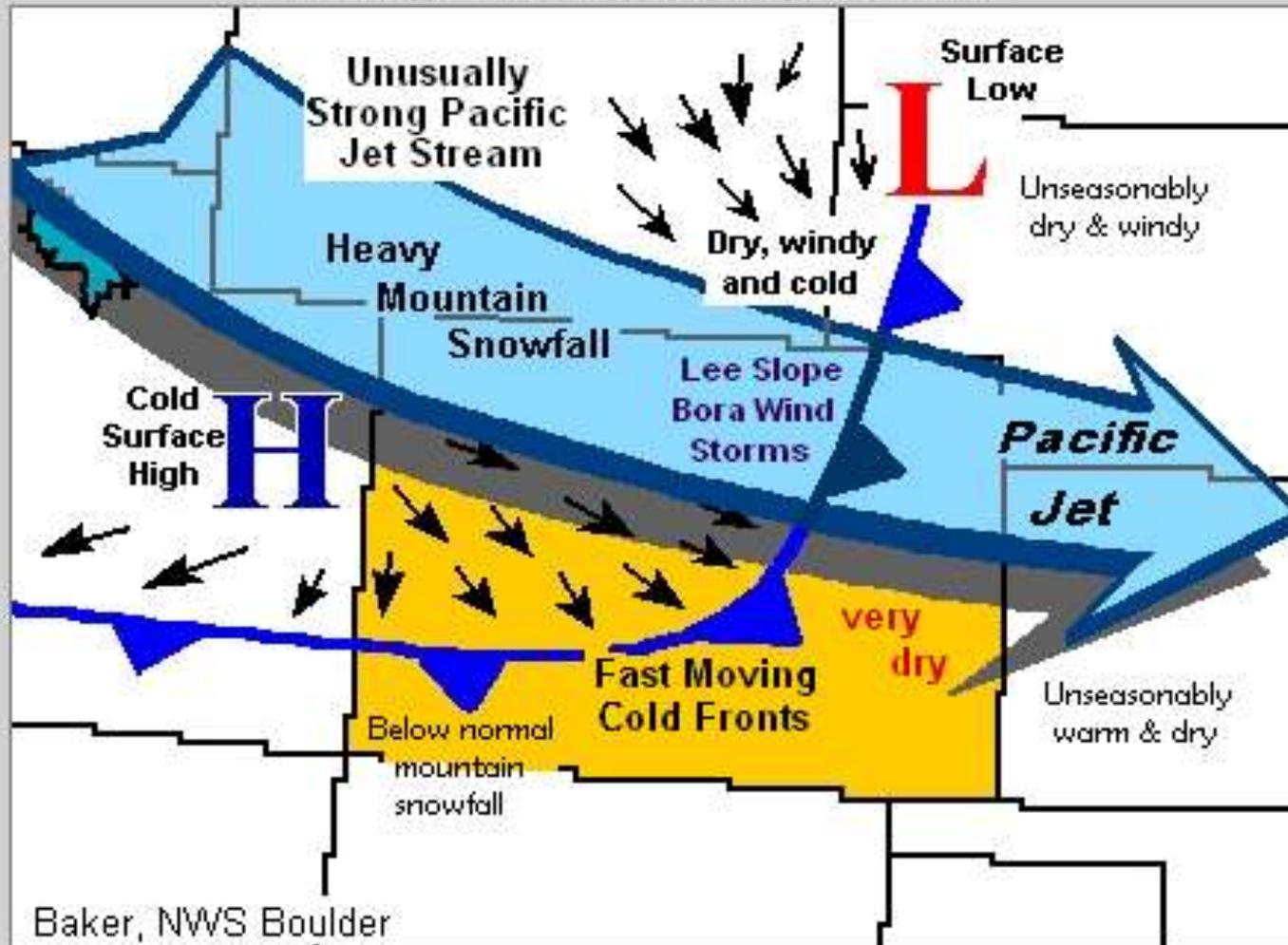
Three different jet stream positions typically observed over the western continental U.S. during the autumn, winter and spring.

Finally, a **southwest oriented jet stream pattern** is typically observed for days if not a week or two at a time during the winter and spring of El Niño episodes, particularly those of moderate to strong intensity.

This southern most jet stream pattern sends wet and windy storms across southern California, the lower Great Basin and Desert Southwest, and eventually up over the four Corners region. The mountains and high valleys of southern Utah, northern New Mexico and southwestern Colorado are impacted most by storms carried along by the Pacific jet in this position. Often the heaviest snowfall occurs in the mountains and valleys of southwest Colorado with storms carried along by this strong southwest flow.

Jet Stream Patterns Influencing
Weather Trends
In Colorado
During
Moderate to Strong La Niñas.

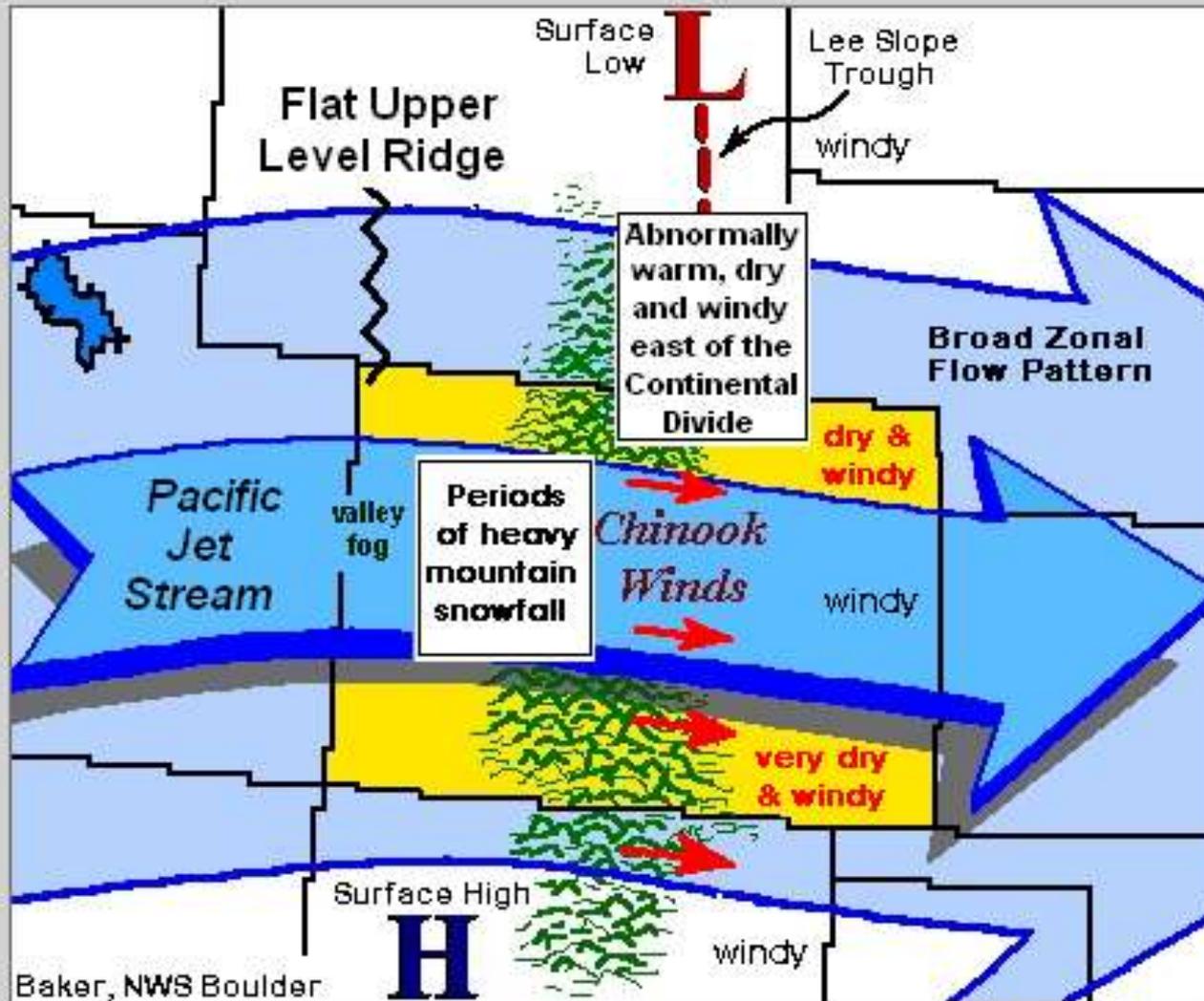
Mean Position of the Pacific Jet Stream Late Autumn and Winter of Moderate to Strong La Niña Episodes



The Pacific jet stream typically assumes a more northwest-to-southeast trajectory during late autumn and early winter of La Niña episodes.

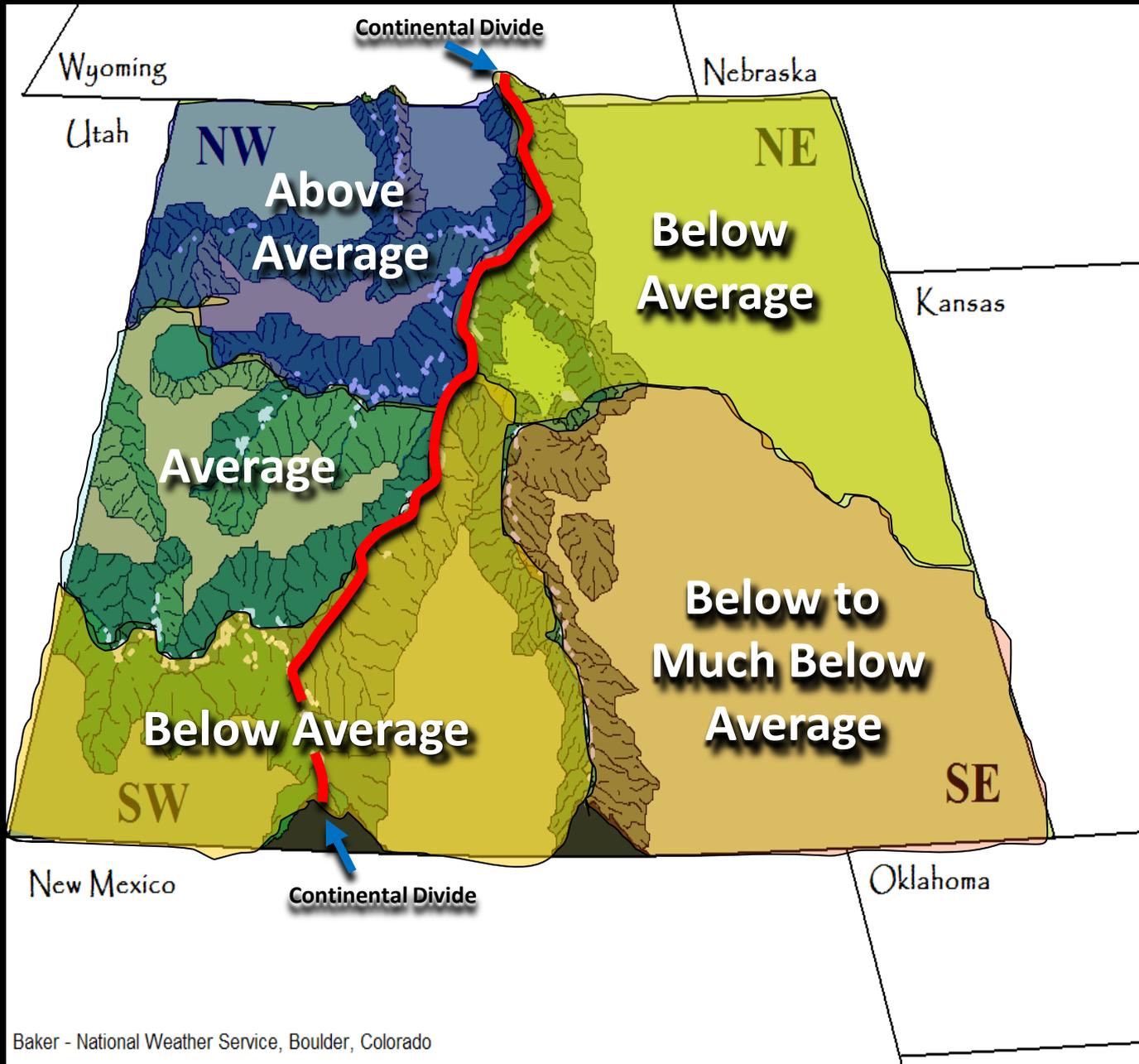
This southward tilt in the Pacific jet typically results in an increase, often a significant increase, in snowfall and wind in the mountains and high valleys of northwest and west central Colorado.

Mean Position of the Pacific Jet Stream During the Spring of Moderate to Strong La Niña Episodes



Later in the winter and during the spring of moderate to strong La Niñas, the Pacific jet stream often becomes zonal or westerly in direction. This warmer and somewhat drier air flow still manages to produce periods of snowfall, at times heavy snowfall, on windward exposed mountain slopes along and west of the Continental Divide.

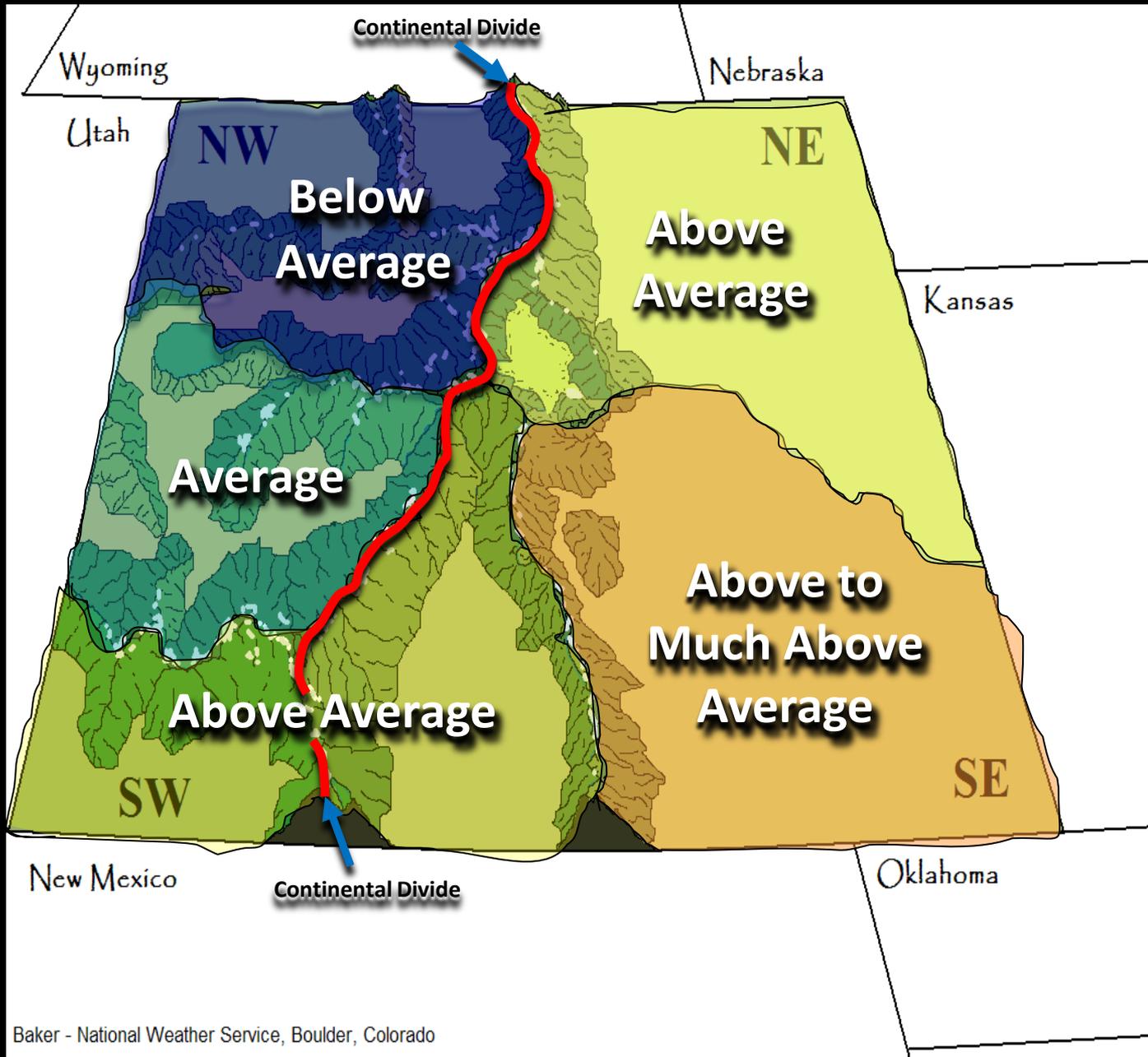
For areas east of the Continental Divide, weather conditions are typically much warmer and drier with periods of strong and gusty downslope winds.



**Winter Season
Precipitation Anomalies
Commonly Observed
During Moderate to
Strong La Niña Episodes**

West central and northwest Colorado commonly receives **AVERAGE** to **ABOVE AVERAGE** precipitation (rain and snow) during moderate to strong La Niñas, predominately from mid-winter through mid-spring.

While southwest and eastern Colorado commonly see **BELOW** to **MUCH BELOW AVERAGE** precipitation (rain and snow) during the entire cold season of moderate to strong La Niñas.



**Winter Season
Temperature
Anomalies Typically
Observed During
Moderate to Strong
La Niña Episodes**

Temperatures across northwest Colorado typically run **BELOW AVERAGE**, particularly when there is an extensive snow cover.

Elsewhere, winter season temperatures run **AVERAGE to ABOVE AVERAGE**, except across the southeast quarter of Colorado where temperatures typically run **ABOVE to MUCH ABOVE AVERAGE**.

Potential Impacts of a Moderate to Strong La Niña on the Colorado Front Range



Above Average Temperatures



Below Average Precipitation and Even Drought



Significantly Reduced Runoff Into Area Lakes and Reservoirs



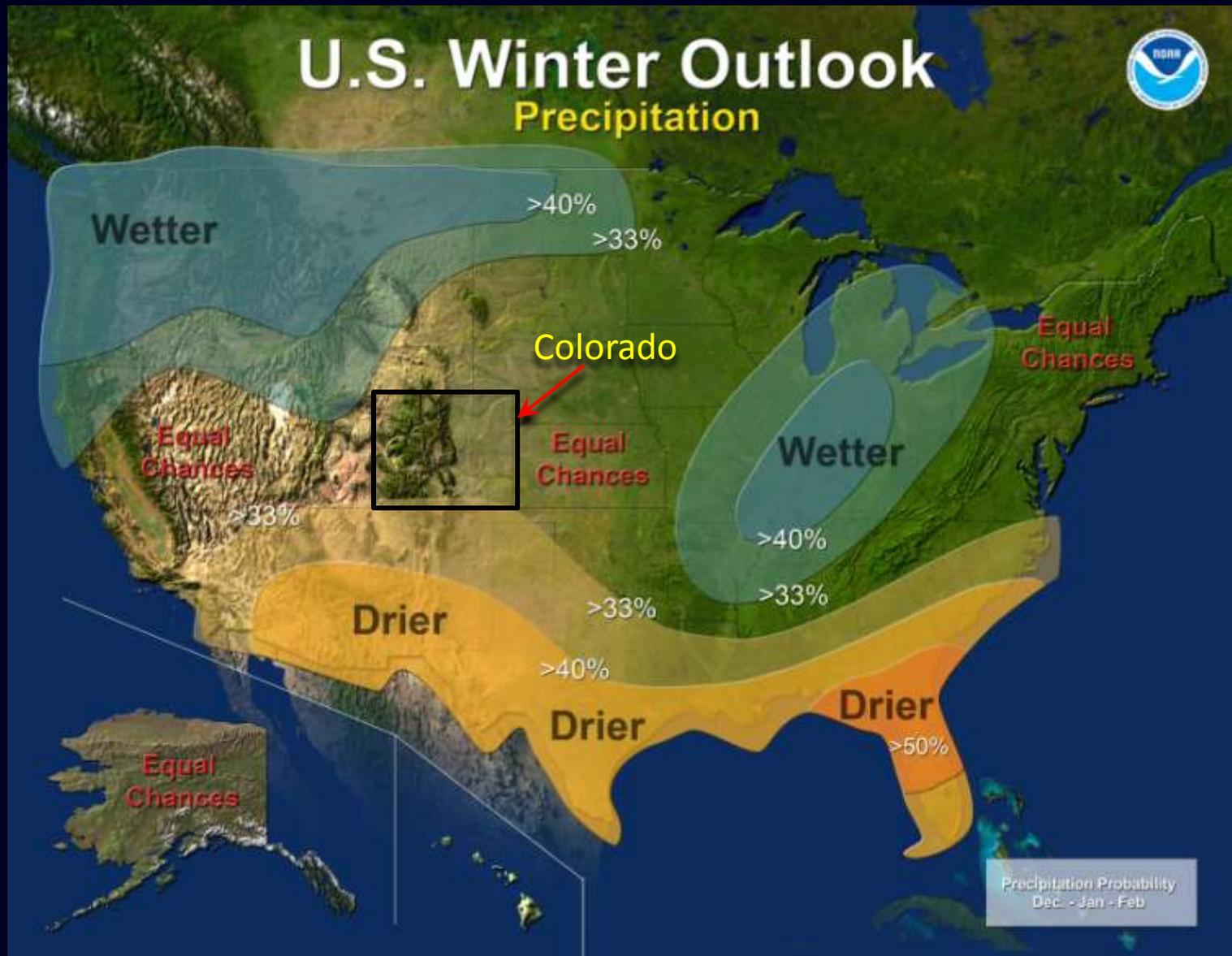
Increased Risk of Wildland Fires



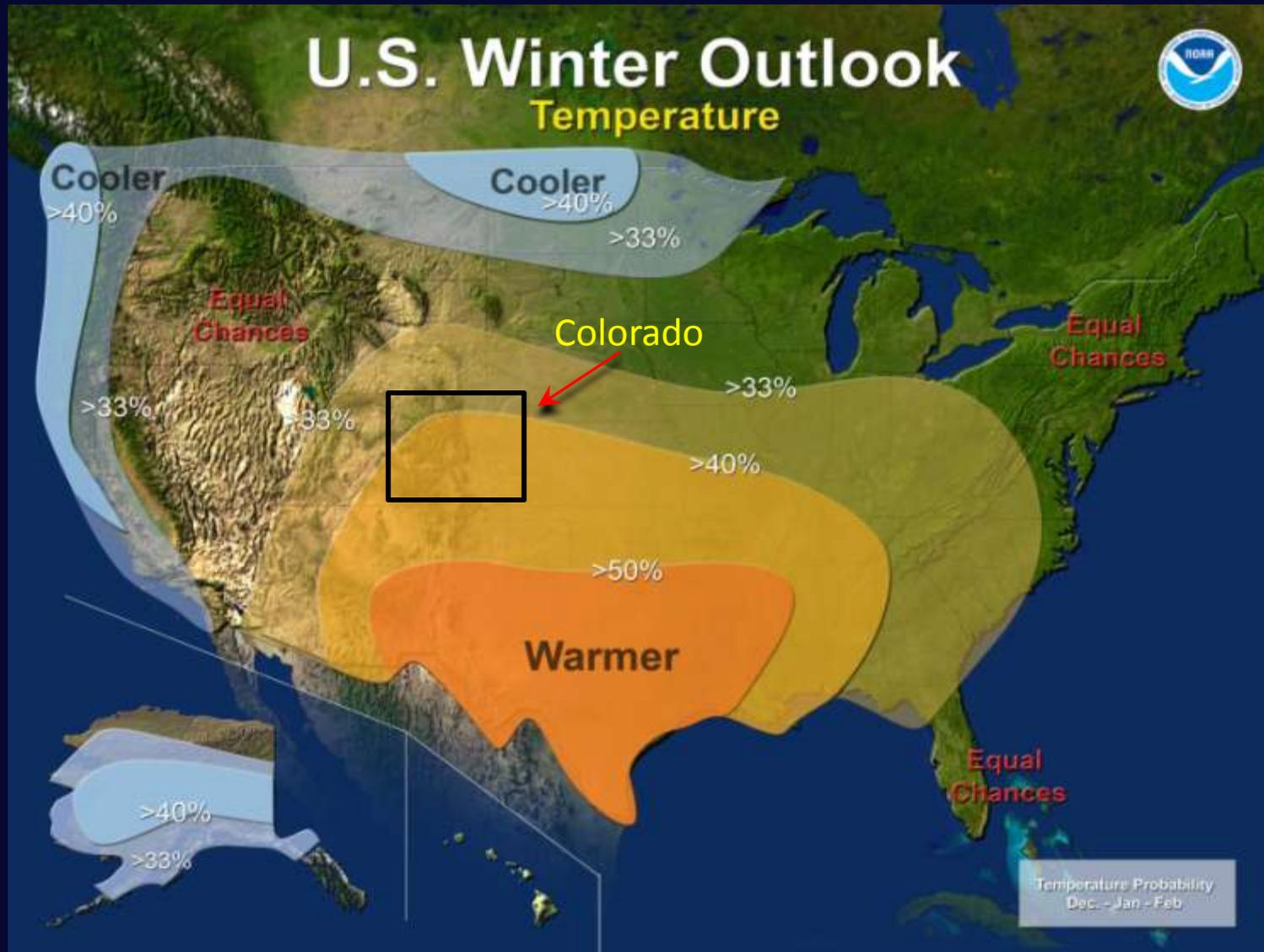
Damaging Downslope Wind Storms

Official Outlook
for the 2010-2011
Winter Season
Issued by NOAA's
Climate Prediction Center



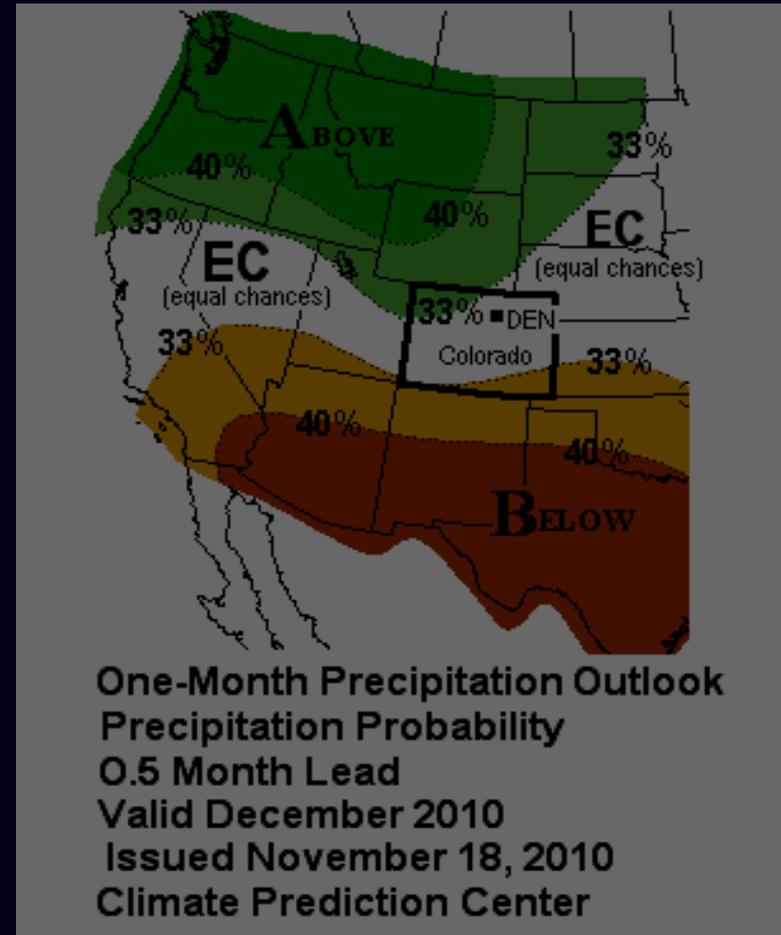
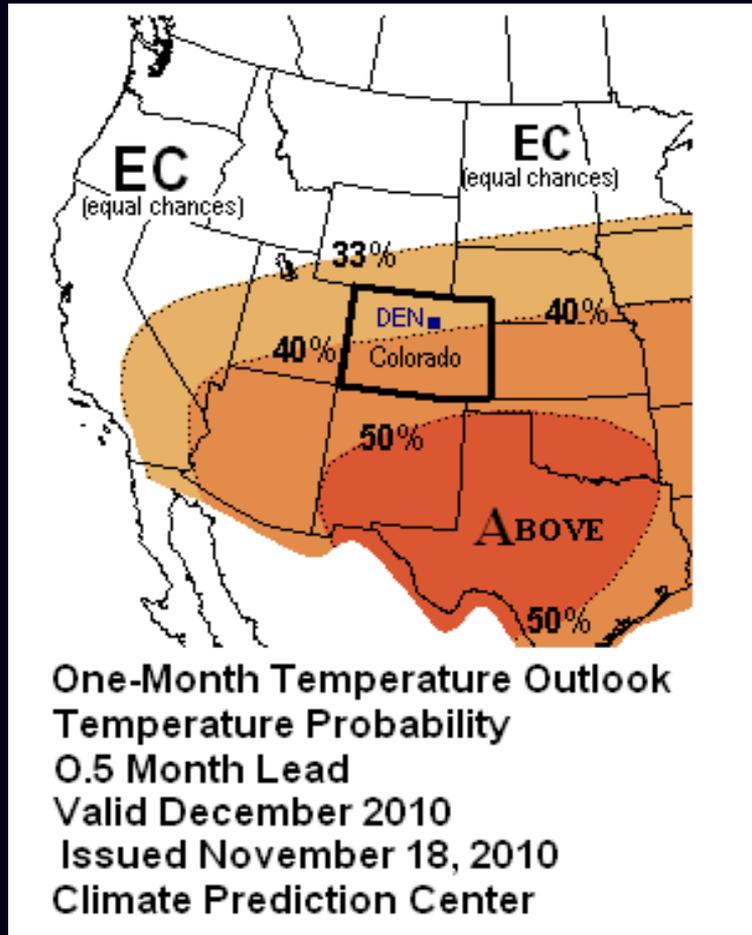


Precipitation Probability for the 3-month winter season of
December, January and February
Issued by NOAA's Climate Prediction Center



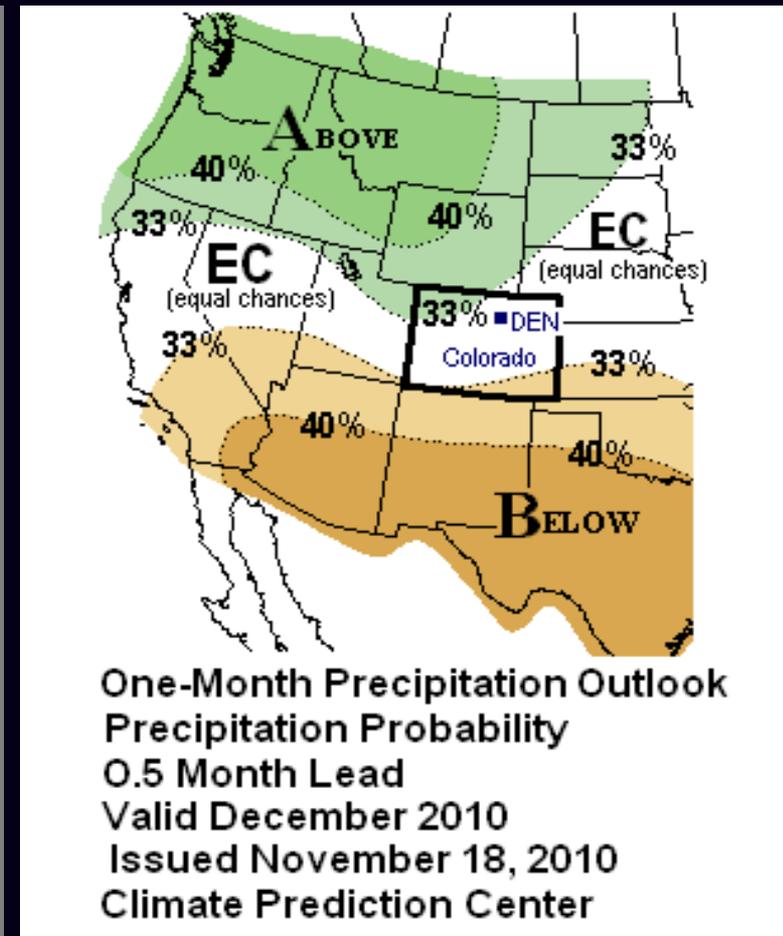
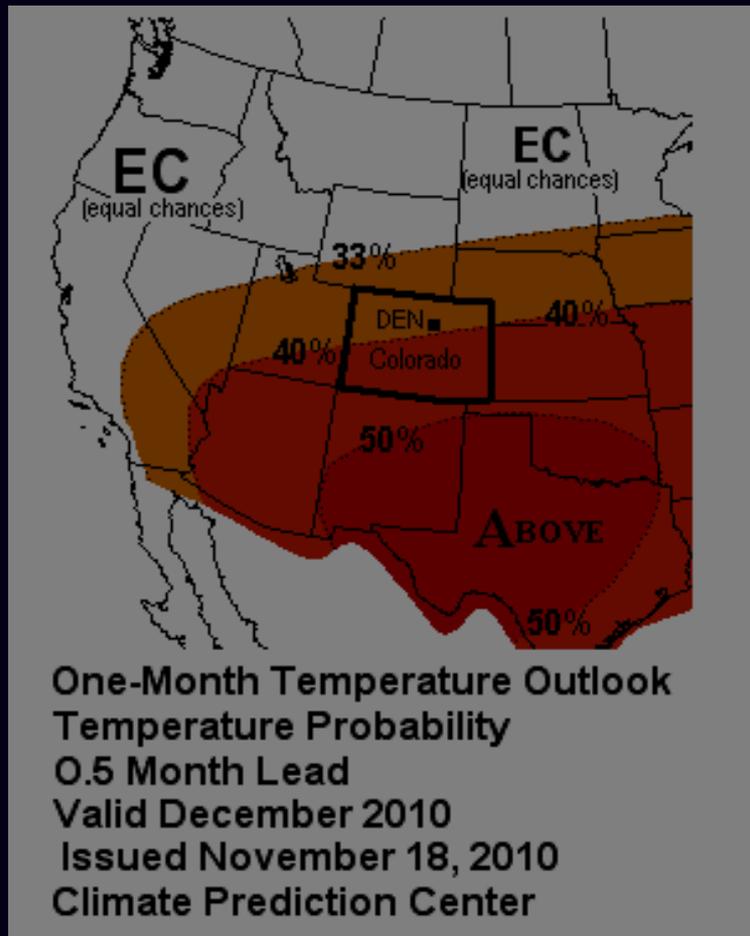
Temperature Probability for the 3-month climate season of December, January and February
Issued by NOAA's Climate Prediction Center

December 2010 Temperature Outlook for Colorado

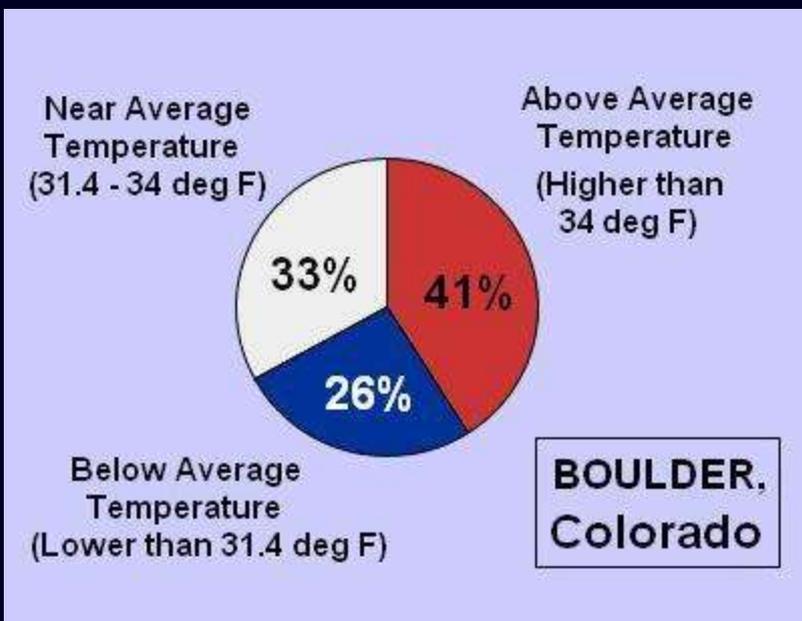
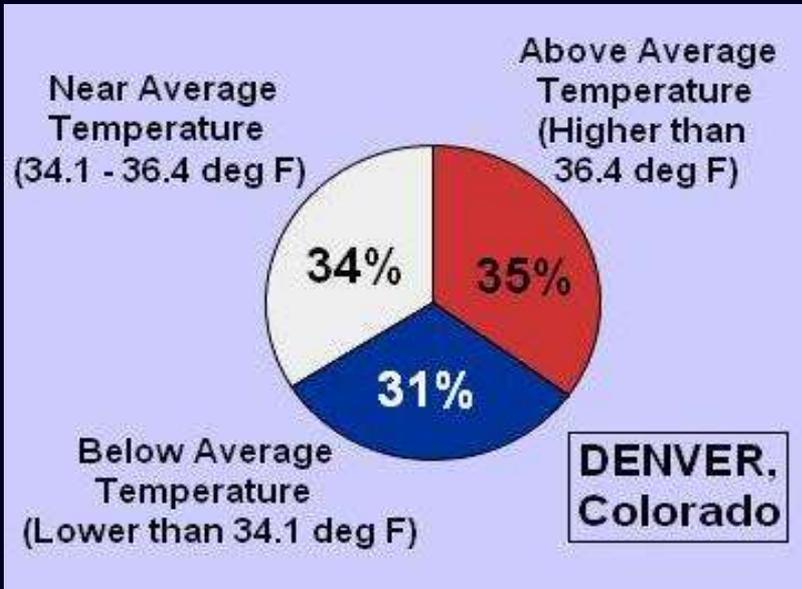


The December 2010 temperature outlook for Colorado as issued by NOAA's Climate Prediction Center is for a 33-40% probability of above average temperature across roughly the northwest half of Colorado, and a 40-50% chance of above average temperature across roughly the southeast half of the state.

December 2010 Precipitation Outlook for Colorado



The December 2010 precipitation outlook for Colorado as issued by NOAA's Climate Prediction Center is for a 33-40% probability of above average precipitation across the northwest corner of the state, a 33-40% chance of below average precipitation across the southeast corner of Colorado, and an equal (or undeterminable) chance of above, below and near average precipitation across the remainder of the state.



December-January-February
2010-2011
Temperature
Outlook for Denver and
Boulder, Colorado Issued
by NOAA's
Climate Prediction Center

Summary

La Niña conditions persist across the central and eastern tropical Pacific Ocean.

SSTs in the tropical Pacific from the International date line to coast of South America ranges from 1.5 to 4 degrees C below average.

Recent equatorial Pacific SST trends and model forecasts indicate La Niña will continue at least through the North Hemisphere spring of 2011.

Present La Niña conditions are forecast to produce average to above average temperatures and below average precipitation across south central and eastern Colorado through the spring of 2011.

Whereas the mountains and valleys in northwest and west central Colorado are more likely to see above, if not above average precipitation (snowfall) and average to below average temperatures this winter and perhaps through much of this spring.